National Institute of Environmental Health Sciences

Risk of malaria reemergence in southern France: Testing scenarios with a multiagent simulation model

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Abstract:

The Camargue, a region in southern France, is considered a potential site for malaria reemergence. All the suitable factors of the disease transmission system are present-competent mosquito vectors, habitats for their breeding, and susceptible people-except for the parasite. The objective of this study was to test potential drivers of malaria reemergence in this system after possible changes in biological attributes of vectors, agricultural practices, land use, tourism activities, and climate. Scenarios of plausible futures were formulated and then simulated using a spatially explicit and dynamic multiagent simulation: the MALCAM model. Scenarios were developed by varying the value of model inputs. Model outputs were compared based on the contact rate between people and potential malaria vectors, and the number of new infections in case of reintroduction of the parasite in the region. Model simulations showed that the risk of malaria reemergence is low in the Camargue. If the disease would reemerge, it would be the result of a combination of unfavorable conditions: introduction of a large population of infectious people or mosquitoes, combined with high levels of people-vector contacts resulting from significant changes in land use, tourism activities, agricultural policies, biological evolution of mosquitoes, and climate changes. The representation in the MALCAM model of interactions and feedbacks between different agents, and between agents and their environment, led in some cases to counterintuitive results. Results from scenario analyses can help local public health authorities in policy formulation.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: MALCAM model

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Extreme Weather Event, Human Conflict/Displacement, Precipitation

Extreme Weather Event: Flooding

Geographic Feature:

resource focuses on specific type of geography

Other Geographical Feature

Other Geographical Feature : wetlands

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Europe

European Region/Country: European Country

Other European Country : France

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Malaria

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content